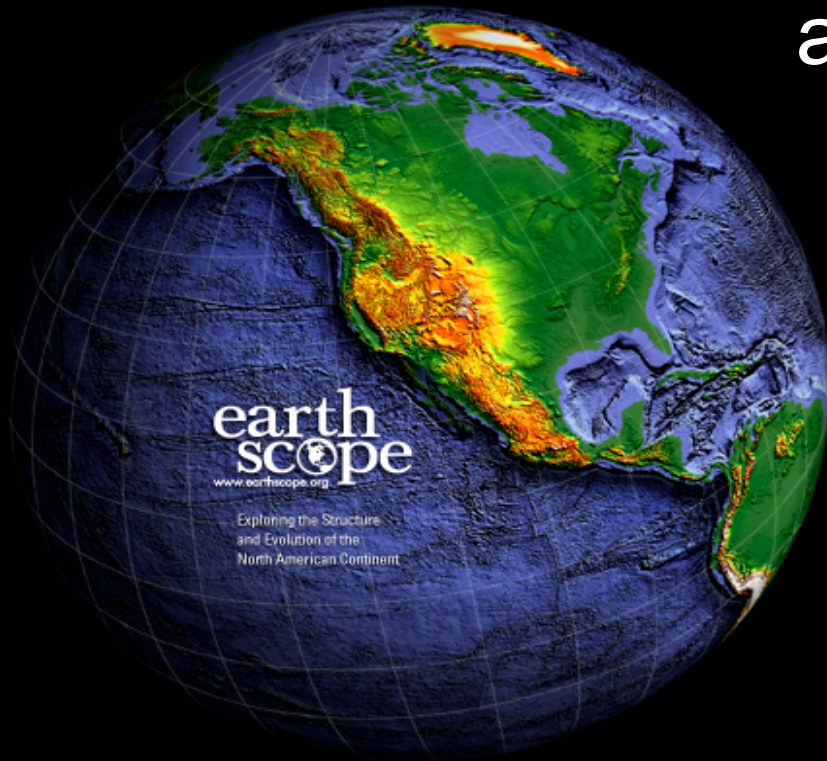
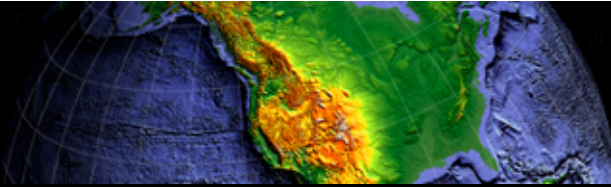


SAFOD Core Viewer

An online visual core sample database
and administrative tool





Core Materials Database

**An online web-based approach using the
Google Maps API**

Brian Blackman

Sr Web Developer

4 May 2009

Wakulla Springs, FL

Acknowledgements

EarthScope is funded by the National Science Foundation.

EarthScope is being operated and maintained as a collaborative effort with UNAVCO and IRIS, with funding contributions from the USGS, NASA, and several other national and international organizations.

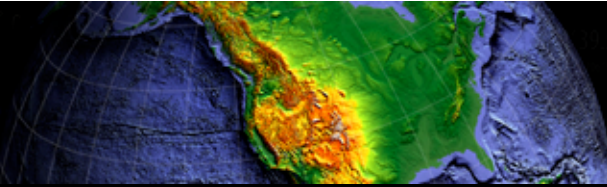
San Andreas Observatory at Depth (SAFOD) is being operated and maintained by UNAVCO with all core materials managed by IODP and the Gulf Coast Repository at Texas A&M University.

The SAFOD Sample Committee conducts cyclical reviews of sample requests from principal investigators and submits recommendations for approval to the NSF.



Overview

- Core Viewer Background
- System Functionality
- Technological Infrastructure
- Necessary Technical Skill Set
- Database Design and Development
- Google Maps API and Core Imagery
- Putting it all together
- Custom Implementations



Background

SAFOD Core Sample Request Processing:

- Off-line Core Sample Request Process
- Core Atlas PPT (size 60 MB or more)
- Sample Request Form Document
- Request Cataloging by Data Products Mngr
- Distribution to SAFOD Review Committee
- Time-sensitivity For Sample Request Processing
- Disparate Review Committee Members
- Sample Request Controls

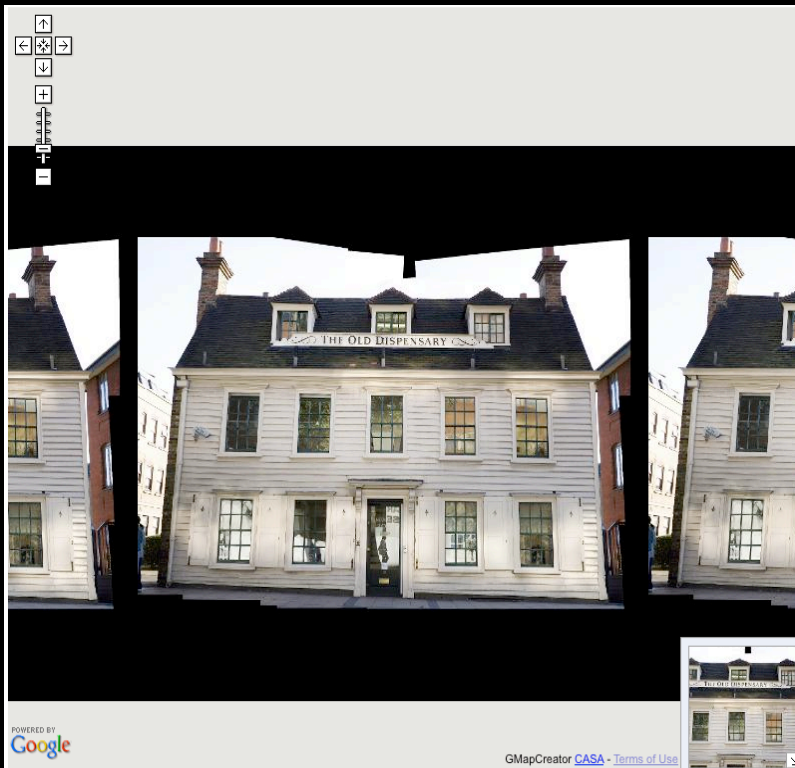
Online Solution Requirements:

- Core Section Imagery Visual Feature with Sample Request Annotation
- Data Input Capabilities
- Collaborative Feature
- Data Validation
- Administrative Capabilities
- User Authentication Feature
- Dynamic Sample Review and Approval Capability

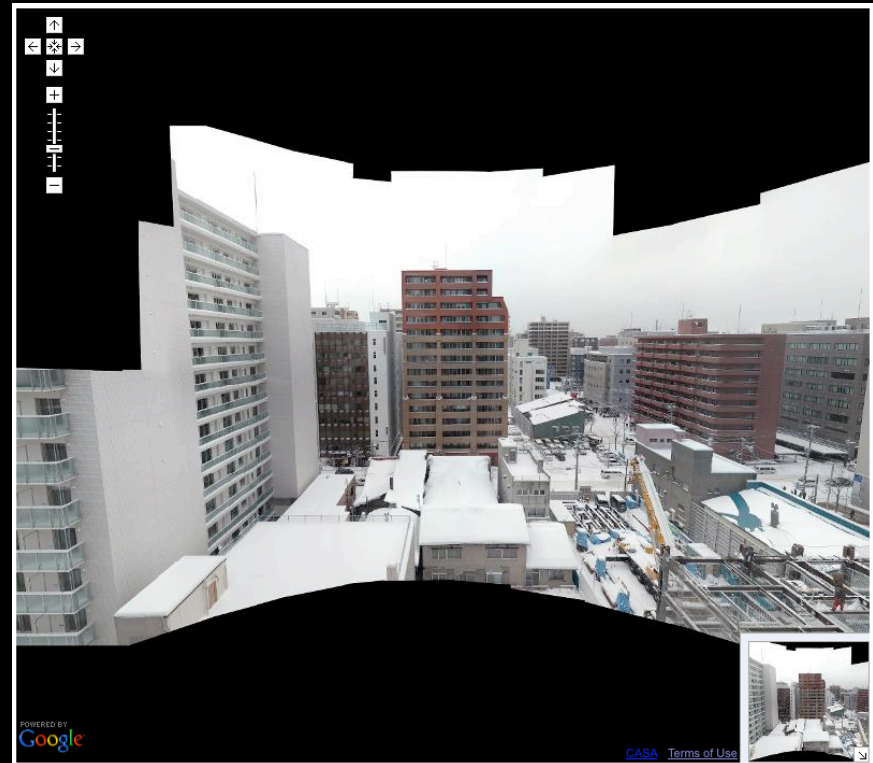
Background

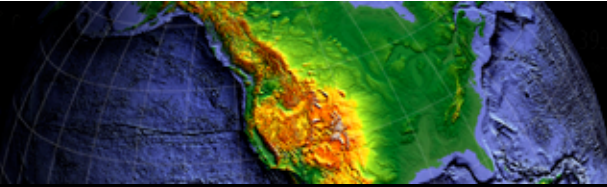
Visual Component Solution: Custom Google Map implementation utilizing high resolution imagery.

House Map



Construction Site Map





Background

Google Map Image Cutter

The Google Maps Image Cutter takes a large image and cuts it into lots of 256x256 pixel images. At the top level there is only one 256 pixel square which is a smaller copy of the original image. At the next level, there are four 256 pixel squares, then sixteen, sixty four and two hundred and fifty six. This corresponds to 256, 512, 1024, 2048 and 4096 pixel square images spread over the map tiles. The application automatically chooses the depth of the maximum zoom level to correspond to the original size of the image, so zooming in any further would make the image bigger and cause it to pixelate.

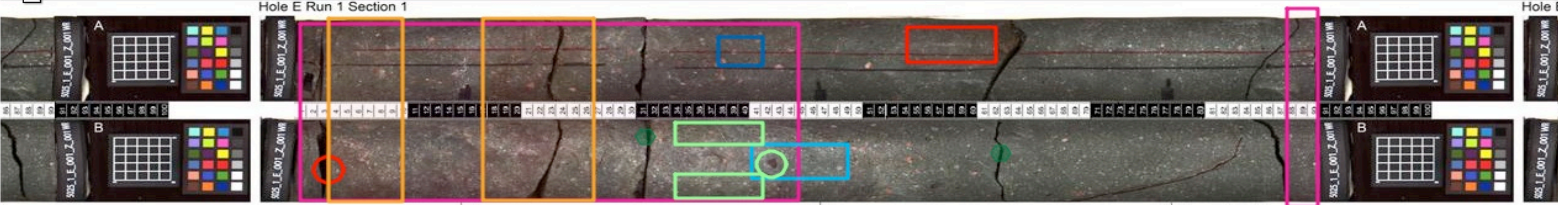
UCL CENTRE FOR ADVANCED SPATIAL ANALYSIS
United Kingdom

<http://www.casa.ucl.ac.uk/software/googlemapimagecutter.asp>


Background

SAFOD Core Viewer Committee Review Component Version 1.0

Select a Hole/Run
Section 1



POWERED BY



Hide All
Show All
Main Menu

[Terms of Use](#)

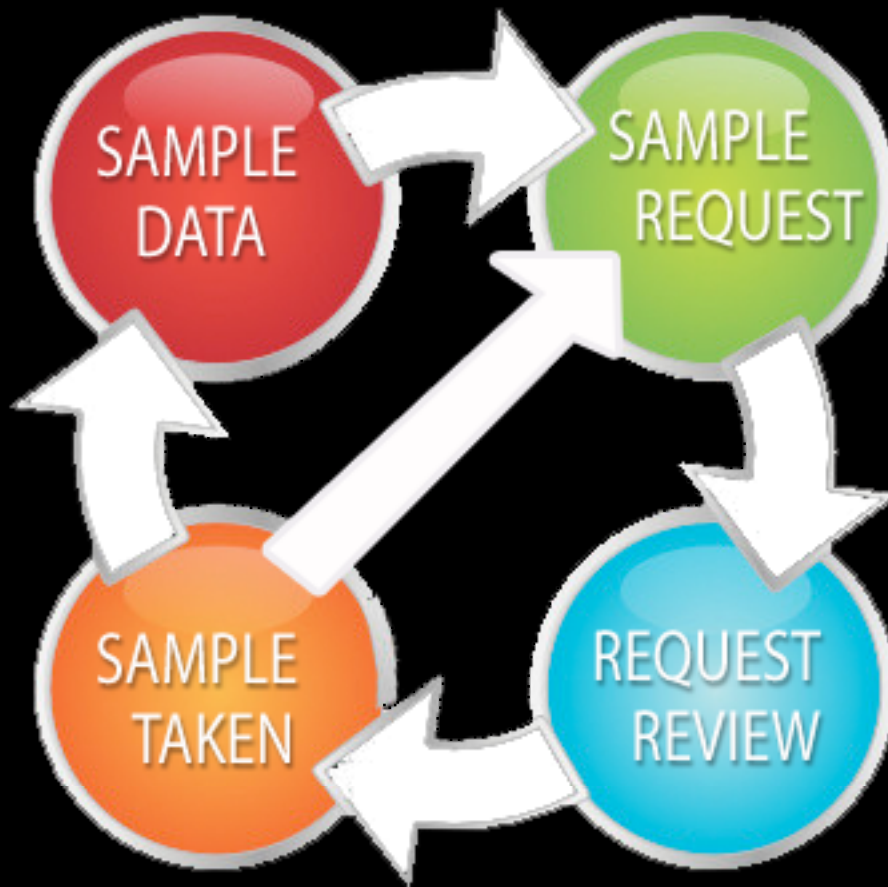
Edit Update Sample ID NUM: Update

Sample Request Details [Hole E - Run 1 - Section 1]

Approved	Request Show/Hide	Group Show/Hide	PI Request	Comments	Modified	Sample Type	Flexible Location	Measurements	Dimension/Volume	Special Instructions
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Blythe:0	View [0] Add	<input type="checkbox"/>	Rubble	YES		~4.5 kilograms, Rubble Ok, approximately filling a 10 in by 6 in sample bag.	Location is flexible within entire core section. Prefer relatively unstrained - fairly coarse grained samples. [one request for section shown with 2 boxes]
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Blythe:1	View [0] Add	<input type="checkbox"/>	Rubble	YES	Fission Track	~4.5 kilograms, Rubble Ok, approximately filling a 10 in by 6 in sample bag.	Location is flexible within entire core section. Prefer relatively unstrained - fairly coarse grained samples. [one request for section shown with 2 boxes]
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chester A:1	View [0] Add	<input type="checkbox"/>	Thin Section	YES		1 inch diam., 1.5 inch long cylinder	location flexible by few inches
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chester A:2	View [0] Add	<input type="checkbox"/>	Thin Section	YES	microfabric	3 inch long, 1/4-Round	oriented, location flexible by few inches
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Evans:1	View [0] Add	<input type="checkbox"/>	Rubble	YES	geochem	~25 g of material	Can be relocated several inches if needed
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Evans:2	View [0] Add	<input type="checkbox"/>	Rubble	YES	geochem	~25 g of material	Can be moved somewhat if needed
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gratier:1	View [0] Add	<input type="checkbox"/>	Solid	NO	priority 1Mass Transfer for creep and sealing	4x3x3 cm	Hard clasts, veins, layering: priority 1
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Mathez:1	View [0] Add	<input type="checkbox"/>	Rubble	YES	total carbon, reduced carbon, and carbon distribution maps	4x4x4 cm or equivalent volume	Orientation not important for any samples

Background

SAFOD Core Viewer Suite

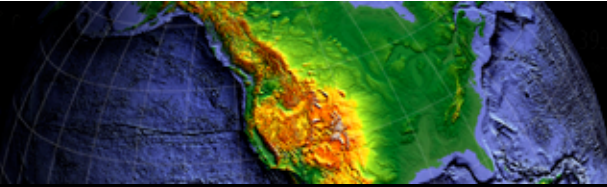


Sample Request Component

Committee Review Component

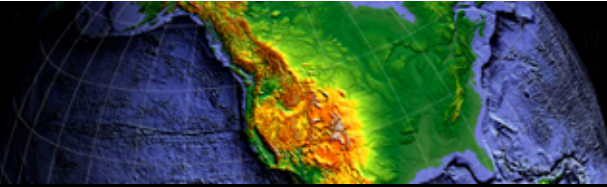
Sample Taken Component

Sample Data Component



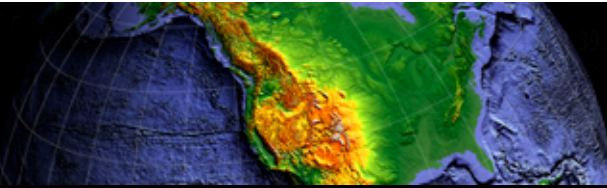
Core Viewer Feature Functionality

- Core Section Imagery within Google Maps Interface
- Data Driven Polyline Annotation of Points of Interest
- Data Driven Marker Info Bubble
- Visual Digitization of Polygon and Circle Shapes
- Show/Hide Controls of Polygon and Circle Shapes
- Hole/Run Core Section Selection
- Four (4) Levels of Zoom Magnification
- Polygon and Circle Annotation of Original Locations if Modified by Committee



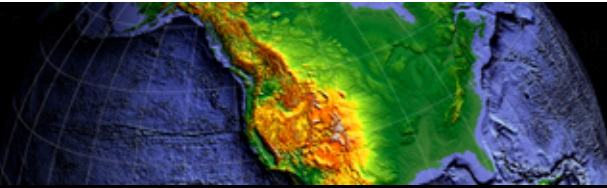
Sample Request Feature Functionality

- User Registration with PI Group Association
- User Authentication and Identification on Request Data
- Dynamic Access to PI Group Digitized Sample Requests
- Sample Request Data Form with Pre-populate Feature
- User Comments on Sample Requests
- Edit and Delete of Sample Request Data
- Core Viewer Digitization of Submitted Sample Requests
- PI Group Member Information and Administration
- User Profile Management
- Printer Friendly User Comments Viewing



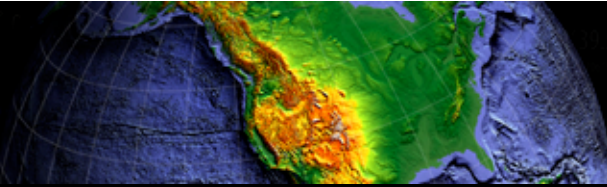
Committee Review Feature Functionality

- Committee Member User Authentication
- Request Cycle Selection
- Review of All Sample Requests per Hole/Run Section
- Re-Digitizing of Existing Sample Requests within the Core Viewer
- Identification of Requests Recommended for Approval
- User Comments per Sample Requests
- View Access to PI Group Research Profile
- View Access to all Sample Request Handling and Analysis Data



Sample Taken Feature Functionality

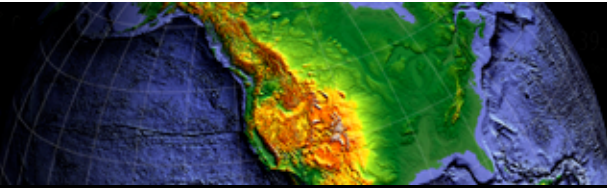
- IODP User Authentication
- Import of Approved Sample Request Records
- Re-Digitizing of Polygon to Local of Sample Taken
- Creation of New Sample Taken Records for Multiple Samples per Sample Request
- Data Entry of Interval and Mass
- User Comments Entry
- Upload of Sample Taken Imagery



System Functionality

Sample Data Feature Functionality

- IODP User Authentication
- Sample Taken Selection
- Science Data Entry
- User Comments Entry
- Resource Reference List Entry

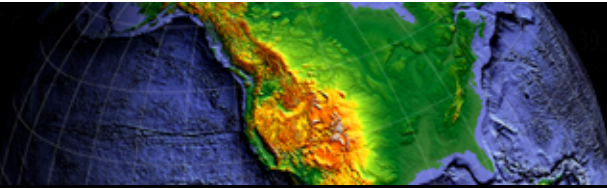


Internet Based Application Infrastructure

- Dedicated System (SUNOS, Linux, MS Server, Apple)
- Web Server (Apache, MS ISS, Websphere, Weblogic)
- Relation Database Software (MySQL, Postgres, MS SQL, Oracle)
- Server Side Application Environment (PHP, JAVA, MS ASP.NET, Perl)

SAFOD Core Viewer Infrastructure:

- SUN T2K
- Apache Web Server
- MySQL
- PHP (CodeIgniter MVC Framework)



Internet Based Application Architecture

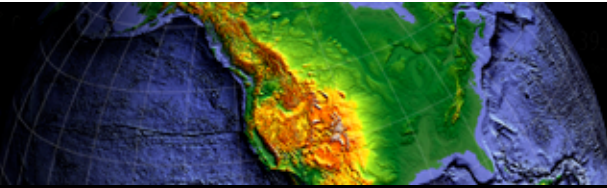
- Presentation View Logic (JavaScript)
- Presentation Communications (AJAX)
- Server Business Logic (Controller - MVC)
- Server Data Access (Model - MVC)
- Server Data Access (MySQL)
- Server Presentation Build Logic (View - MVC)

Technical Skill Sets

- HTML, CSS, and JavaScript Development
- Google Maps API (JavaScript)
- Server Development (PHP, Java, MS, other)
- XML (Data Delivery)
- Database Design (Normalization of Data)
- Database Development (Implementation)
- Server Management (System Admin)
- Framework Implementation (CodeIgniter, Cake, .Net, Websphere, WebLogic)

Relational Database Design

- Identify All Data Requirements
- Define Individual Data Elements
- Group Data Elements
- Identify or Create Relationship Between Groups
- Create Join Data Groups where Necessary
- Review and Refine Data Groups
- Eliminate Redundant Data Where Possible
- Build In Extensibility
- Define Primary and Foreign Keys
- Define Indexes on Fields Most Often used In Query



Relational Database Development

- Install Chosen Database on Server
- Install Client Interface or Use Command Line
- Create Database Schema
- Create Database Tables
- Add Fields, Keys, and Indexes
- Add Extensibility (Views, Stored Procedures, etc)

Base Line Implementation

- Key Registration

<http://code.google.com/apis/maps/signup.html>

- Add Key to HTML Header

```
<script src="http://maps.google.com/maps?file=api&v=2&key=ABXYZAA1EgixrJMsPsAlymlF5T2lhR-
Wc2HscPmAVjHFRKnwBGQQg97hhQXhVXoQ07_xw7SbiOZRgrr6t6iDQ" type="text/javascript"></script>
```

- Add a MAP Div to your HTML

```
<div id="map" style="height: 387px; width:100%"></div>
```

- Add JavaScript Implementation of API

```
<script type="text/javascript">
    if (GBrowserIsCompatible()) {
        safodMapProjection = new GMercatorProjection(19);

        map = new GMap2(document.getElementById("map"), {mapTypes:[sec_01]})
        ...
    }
    else {    alert("Sorry, the Google API is not compatible with this browser");    }
</script>
```

Core Imagery Instead of Map

- Cut Core Images (Google Map Cutter)
- Upload New Images to Core Section Folder
- Add Image Handler Routine

```
// =====
// ===== Custom Tile Image Handler Function for Google Maps API =====
// ===== Images generated from GMapImageCutter Java App =====
// ===== All Image Tiles are 256px X 256px =====

function customGetTileURL(a,b) {
  //converts tile x,y into keyhole string
  var c=Math.pow(2,b);
  var d=a.x;
  var e=a.y;
  var f="t";
  for(var g=0;g<b;g++){
    c=c/2;
    if(e<c){
      if(d<c){f+="q"}
      else{f+="r";d-=c}
    }
    else{
      if(d<c){f+="t";e-=c}
      else{f+="s";d-=c;e-=c}
    }
  }
  return url+f+".jpg"
}
```

Core Imagery Instead of Map

- Provide Dynamic Reference of Image Folder to Google Map API

```
if (GBrowserIsCompatible()) {
// =====
// ===== Create the GTileLayer =====
// ===== adn apply the CustomGetTileUrl to it
var tilelayers = [new GTileLayer(copyrightCollection,1,4)];
tilelayers[0].getTileUrl = customGetTileURL;

// =====
// ===== Create the GTileLayer =====
// ===== adn apply the CustomGetTileUrl to it
safodMapProjection = new GMercatorProjection(19);
```

- Dynamic URL Bulding

```
/image/safod/hole_E_run_1_sec_1_tiles
```

```
url = "/images/es_data_page/safod_core_data/" + tileURL + section + "_tiles/";
```

Data Driven Polyline Annotation

- Database Containing Digitized Google Latitude Longitude Values
- Coordinates Assigned to Array Object
- Shape Routine Called with Parameters

```
drawPolygon(rectAr, piColor, infoWin, markerPoint);
```

```
//=====
```

```
// ===== Polygon Construction Method =====
```

```
function drawPolygon(points, color, infoWin, markerPoint) {
    polObj=new GPolygon(points, color, 3, 1, color, 0.03);
    map.addOverlay(polObj);
```

```
    GEvent.addListener(polObj, "click", function() {
        map.openInfoWindowHtml(markerPoint, infoWin);
    });
```

```
    xlylMarkerAr[shapeAr.length] = new GMarker(points[1], {draggable: true, bouncy: true});
    xryrMarkerAr[shapeAr.length] = new GMarker(markerPoint, {draggable: true, bouncy: true});

}
```



Phase: 3

Cycle: 1

PI Group: Gratier

Interval: 35-40 cm

Mass: 240 grams

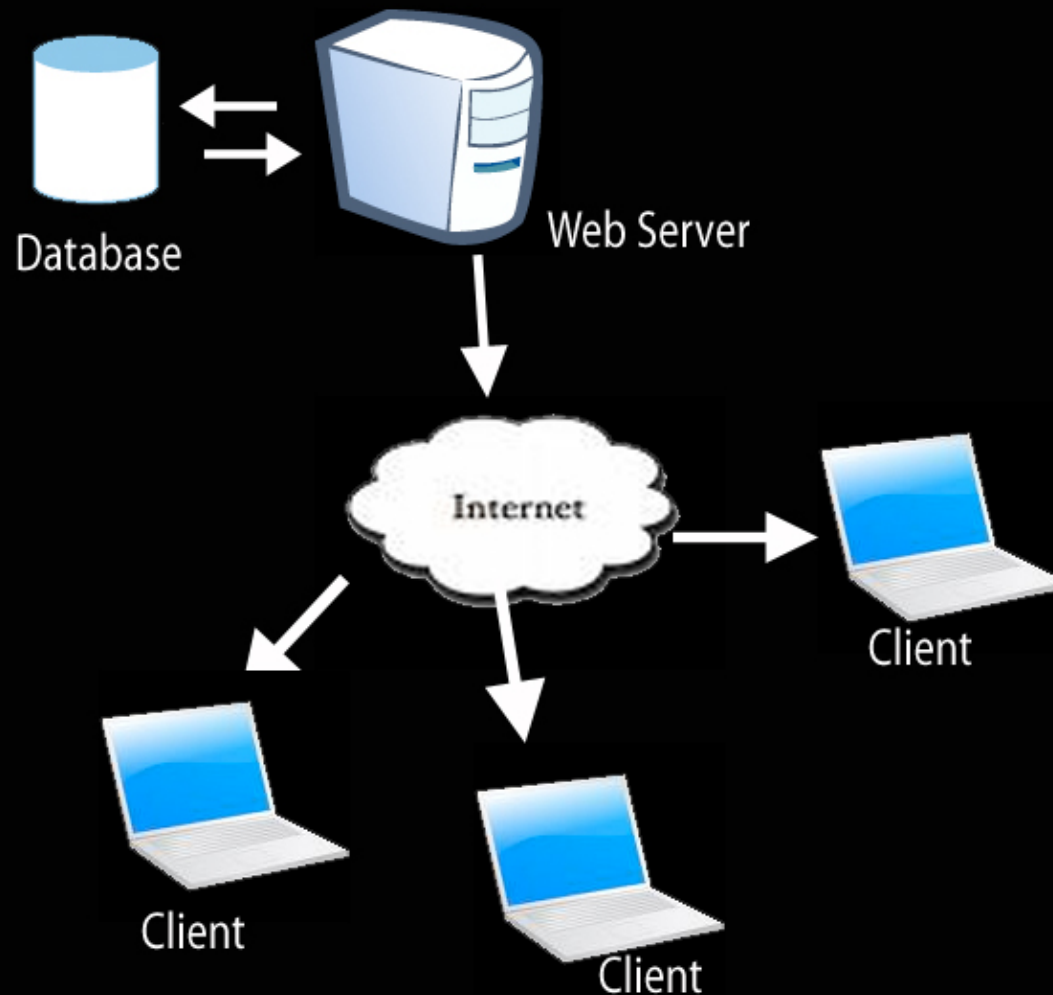
Details: priority 1Mass Transfer for creep and scaling

0 Comments



Putting it Together

Application Components



Putting it Together

Sample Requests Component

Core Viewer Selected Section: Hole E - Run 1 - Section 3

SAFOD Phase III Core Samples

Core Viewer

Sample Request Form

My Sample Requests

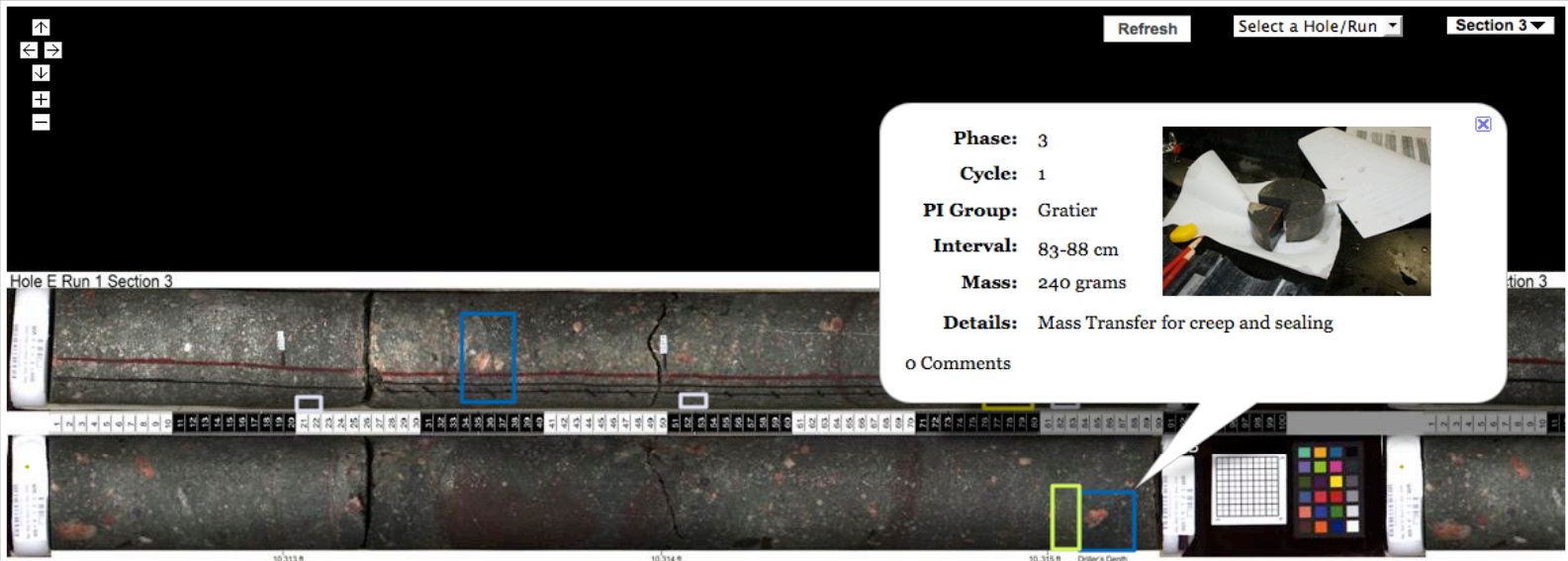
Core Viewer Information

Sample Request Guidelines

Refresh

Select a Hole/Run

Section 3



Phase: 3

Cycle: 1


PI Group: Gratier

Interval: 83-88 cm

Mass: 240 grams

Details: Mass Transfer for creep and sealing

0 Comments



Hide All

Show All

Terms of Use

Cycle 1 Samples Taken [Hole E - Run 1 - Section 3]

Visible	Phase	Cycle	PI Group	Interval	Mass
<input checked="" type="checkbox"/>	3	1	Chester_A	83-88 cm	205 g
<input checked="" type="checkbox"/>	3	1	Evans	81-83 cm	38 g
<input checked="" type="checkbox"/>	3	1	Gratier	33.5-37.5 cm	204 g
<input checked="" type="checkbox"/>	3	1	Gratier	83-88 cm	240 g
<input checked="" type="checkbox"/>	3	1	Faulkner	81-83 cm	47 g
<input checked="" type="checkbox"/>	3	1	Holdsworth	81-83 cm	35 g
<input checked="" type="checkbox"/>	3	1	Lockner	75.5-79.5 cm	39 g

Cycle 1 Core Samples Taken in 2008:

The SAFOD Core Viewer available here displays location and data pertaining to core material samples taken in 2008 during the cycle one processing. Approximately 190 samples were distributed to 18 investigators/groups over the past year by IODP personnel, headed by John Firth. The Gulf Coast Repository (GCR) prepares and distributes approved samples to the requesting investigators.

Sample taken data and images are available by clicking on the colored shape overlays on the Core Section image displayed in the Core Viewer above, or by clicking the Interval or Mass hyperlinks in the table to the left. Click the sample taken image in the Info Bubble to see additional sample taken images. (Mozilla Firefox Browsers Only)

For further information, please review the PDF document [SAFOD Core Distribution](#) or contact the EarthScope Program Director at the National Science Foundation (kshedloc@nsf.gov).

Sample Requests Component

Core Viewer Selected Section: Hole E - Run 1 - Section 1 SAFOD Phase III Core Samples

Core Viewer | **Sample Request Form** | My Sample Requests | Core Viewer Information | Sample Request Guidelines

* Ensure that you always select or enter the correct values on all required fields for every request submitted. ☒ Preload Previous Request Data

Core Section

* Hole: * Run: * Section:

Material Analysis

*Destructive?: Yes ☒ No ☐

Describe Analysis Processes: (Measurement)

XRC

Explain Purpose:

Stress measurements

Analysis Data

Data Types: (mesoscopic, microscopic fabric orientation data, major and minor whole rock compositions [XRF/XRD], etc.)

XRF/XRD

Expected Results:

Data analysis from stress test

Sample Specifications

* Core Interval: * Estimated Mass:

Enter Values In Centimeters Enter Value In Grams

*Flexible on Requested Location?: Yes ☒ No ☐

*Sample Type: *Priority:

Dimension Specifications:

No more than 5 cm

Special Instructions:

Special Handling

Packaging and Shipping Instructions:

Sample Return

Expected Mechanical Condition:

Expected Chemical Condition:

Sample Requests Component

Core Viewer Selected Section: Hole E - Run 1 - Section 1

SAFOD Phase III Core Samples

Core Viewer Sample Request Form My Sample Requests Core Viewer Information Sample Request Guidelines

PI Group Sample Requests

Reference	PI Group	Date	Request By	Hole	Run	Section	Interval	Mass	Type
101-3-E12	Blackman's TEST PI Group	2009-03-06	Brian Blackman	E	1	2	32-32	33g	Polyhedron
101-4-E11	Blackman's TEST PI Group	2009-03-06	Brian Blackman	G	1	1	33-33	44g	Polyhedron
101-5-E11	Blackman's TEST PI Group	2009-03-06	Brian Blackman	E	1	3	44-44	34	Polyhedron
101-6-E11	Blackman's TEST PI Group	2009-03-13	Brian Blackman	E	1	1	44-44	55	Thin-Section Billet

Reference Number: 101-4-E11

Edit 101-4-E11

Delete 101-4-E11

Sample Type: Polyhedron

Interval: 33-33

Mass: 44g

* Ensure that you always select or enter the correct values on all required fields for every request submitted.

Core Section

* Hole: G * Run: 1 * Section: 1

Material Analysis

*Destructive?: Yes No

Describe Processes:

stress testing

Explain Purpose:

Sample Specifications

* Core Interval: 33-33 * Estimated Mass: 44g

*Flexible on Requested Location?: Yes No

*Sample Type: Polyhedron *Priority: 1

Dimension Specifications:

Special Instructions:

Putting it Together

Sample Taken Component

Log out

Select a Hole/Run ▼ Section 1 ▼

Hole E Run 1 Section 1

3025_1_E_001_Z_001.WR

3025_1_E_001_Z_001.WR

10.307 ft 10.308 ft 10.309 ft Driller's Depth

POWERED BY Google

Hide All Show All Edit Selected Sample Chester_A:2 Box 1 Digitize

[Terms of Use](#)

Sample Taken Data For [Hole E - Run 1 - Section 1]

Select	PI Number	Comments	Phase	Hole	Run	Section	Interval	Mass	Picture
<input checked="" type="checkbox"/>	Chester_A : 2	View [0] Add	3	E	1	1	56-61	176	E-R1-S1.jpg
<input checked="" type="checkbox"/>	Evans : 1	View [0] Add	3	E	1	1	61-63	95	E-R1-S1.jpg
<input checked="" type="checkbox"/>	Gratier : 1	View [0] Add	3	E	1	1	35-40	240	E-R1-S1.jpg
<input type="checkbox"/>	Enderlin : 1	View [0] Add	3	E	1	1	16-18	0	
<input type="checkbox"/>	Enderlin : 1	View [0] Add	3	E	1	1	47-49	0	
<input type="checkbox"/>	Enderlin : 1	View [0] Add	3	E	1	1	79.5-81.5	0	

Update Sample Data

PI: Duplicate Sample: ☐

Phase:

Hole:

Run:

Section:

Interval:

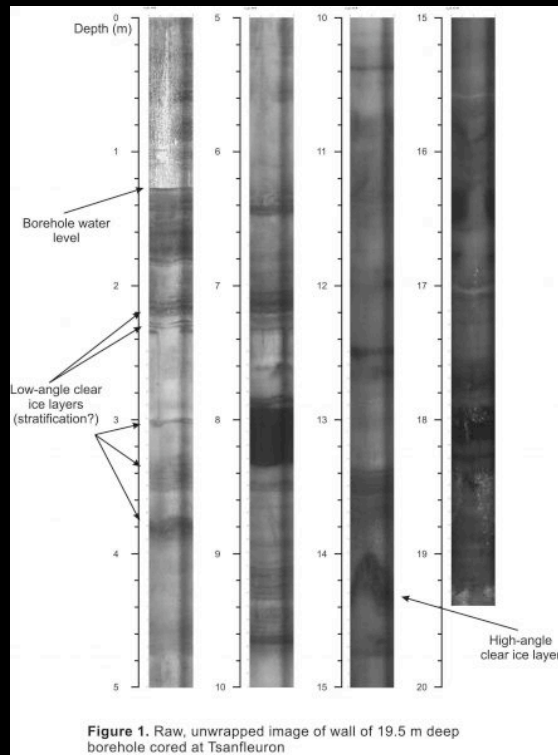
Mass:

Upload: [Browse...](#)

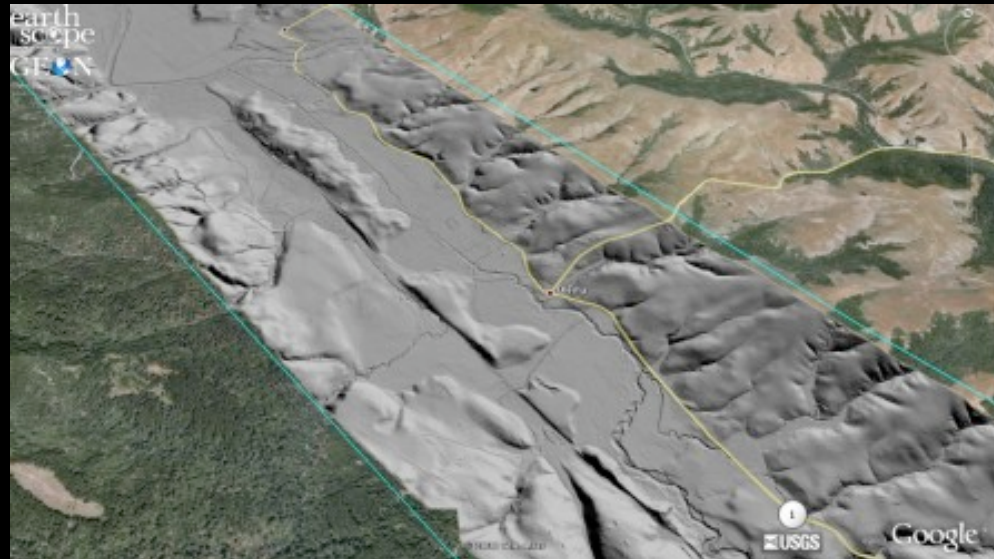
[Update Sample Data](#) Picture Only: ☐

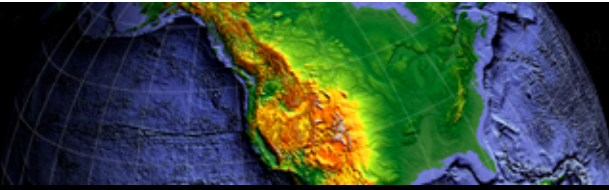
Custom Implementations

Core Imagery



LiDAR Imagery





19°53'N λ 105°12'20.02"W

19°13'25.41.4952000"N λ 99°20'50.5752000"W

46°44'N λ 46°8'43.08"W

Questions?